FINAL

Site-Specific Work Plan for the Passive Diffusion Bag Sampler Demonstration at Pease AFB, New Hampshire

Prepared For

U.S. Department of the Army, Corps of Engineers,
Omaha District
Omaha, Nebraska

Contract 44650-99-D-005
Delivery Order DK01

U.S. AIR FORCE

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SITE-SPECIFIC WORK PLAN FOR THE PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION AT PEASE AFB, NEW HAMPSHIRE

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Prepared for:

U.S. Army Corps of Engineers, Omaha District

and

Air Force Center for Environmental Excellence
Technology Transfer Division
and
Air Force Base Conversion Agency

CONTRACT NO. F44650-99-D-0005

Delivery Order DK01

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AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFCEE/ERT	Air Force Center for Environmental Excellence, Technology Transfer Division
bgs	below ground surface
BRAC	Base Realignment and Closure
CAS	Columbia Analytical Services
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DoD	Department of Defense
ft/day	feet per day
ft/ft	foot per foot
GIS	geographical information system
HASP	Health and Safety Plan
MWH	MWH Americas, Inc.
MNO	monitoring network optimization
µg/L	micrograms per liter
Parsons	Parsons Engineering Science, Inc.
PCE	tetrachloroethene
PDA	Pease Development Authority
PDBS	passive diffusion bag sampler
PRB	permeable reactive barrier
RL	reporting limit
RPD	relative percent difference
RPO	remedial process optimization
SAP	Sampling and Analysis Plan
SARA	Superfund Reauthorization Act
STL	Severn Trent Laboratories
TCE	trichloroethene
USACE	United States Department of the Army, Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 Project Description and Location

On 22 January 2002, Parsons Engineering Science, Inc. (Parsons) was awarded delivery order DK01 under US Department of the Army, Corps of Engineers (USACE) Contract Number F44650-99-D-0005 to provide services, technical labor-hours, and materials to support Remedial Process Optimization (RPO) evaluations and demonstrate the effectiveness of Passive Diffusion Bag Samplers (PDBSs) for sampling volatile organic compounds (VOCs) in existing groundwater monitoring programs at selected Base Realignment and Closure (BRAC) sites administered by the Air Force Base Conversion Agency (AFBCA). The Technology Transfer Division of Air Force Center for Environmental Excellence (AFCEE/ERT) has initiated the PDBS demonstration to introduce this technology to multiple Department of Defense (DoD) installations and to improve the cost effectiveness of groundwater monitoring programs for VOCs. This site-specific work plan is for the demonstration of the PDBS technology at the former Pease Air Force Base (henceforth referred to as Pease AFB), New Hampshire.

Diffusion sampling is a relatively new technology designed to utilize passive sampling techniques that eliminate the need for well purging. Specifically, a diffusive-membrane capsule is filled with deionized/distilled water, sealed, suspended in a well-installation device, and lowered to a specified depth below the water level in a monitoring well. Over time (no less than 72 hours), the VOCs in the groundwater diffuse across the membrane, and the water inside the sampler reaches equilibrium with groundwater in the surrounding formation. The sampler is subsequently removed from the well, and the water in the diffusion sampler is transferred to a sample container and submitted for laboratory analysis of VOCs. Benefits of diffusion sampling include reduced sampling costs and reduced generation of investigation-derived waste.

1.2 Objectives

The PDBS demonstration at Pease AFB has three primary objectives:

- Develop vertical profiles of VOC concentrations across the screened intervals of the sampled monitoring wells;
- Assess the effectiveness of PDBS by statistically comparing groundwater analytical results for VOCs obtained using the current (conventional) sampling method with results obtained using the PDB sampling method. VOC results from the scheduled September/October groundwater monitoring event will be compared to the results obtained using the PDBS method; and
- Compare the costs of PDB and conventional sampling.

Vertical contaminant profiles will be developed by placing PDBSs at discrete depths within the saturated screened interval of each monitoring well included in the demonstration, and analyzing the resulting samples for VOCs. The resulting information will aid the Base in evaluating contaminant migration and fate in the saturated zone, and will allow optimization of the Basewide Groundwater Sampling and Analysis Program. The statistical comparison of the conventional and diffusion sampling results will allow assessment of the appropriateness of implementing diffusion sampling for VOCs at each sampled well.

1.3 Scope

The PDB sampling demonstration at Pease AFB will require two mobilizations to the site - one to place the diffusion samplers in the selected monitoring wells, and a second to retrieve the samplers from the wells. The PDBSs will be installed in early September 2002 to provide adequate equilibration time before the current sampling contractor for the Base, MWH Americas, Inc. (MWH) begins the scheduled sampling event in late September or early October 2002. To the extent feasible, the PDBSs will be retrieved immediately prior to conventional sampling at the selected wells to ensure temporal comparability of the analytical results obtained using the two methods. The PDBSs will be in place for a minimum of 14 days, which fulfills the 14-day minimum equilibration time period specified in the Draft BRAC PDBS Project Work Plan (Parsons, 2002).

1.4 Document Organization

This work plan is organized into seven sections, including this introduction, and three appendices. The site description summarized from 2001 Annual Reports for Sites 49 and 73 (MWH, 2002a and 2002b) are presented in Section 2. Section 3 presents the scope of the PDBS demonstration at Pease AFB. Project organization, schedule, and an overview of the PDBS site-specific results report are summarized in Sections 4, 5, and 6, respectively. References used in the preparation of this work plan are presented in Section 7. Appendix A is a site-specific addendum to the Program Health and Safety Plan (HASP) (Parsons, 2002). Historic site-specific groundwater quality data for Pease AFB is provided in Appendix B. Appendix C contains selected groundwater sampling procedures from the Final Installation-Wide Quality Program Plan (MWH, 2001).

2.0 BACKGROUND

2.1 Location and History of Pease AFB

The 4,300-acre Pease AFB is located on a peninsula in Rockingham County in southeastern New Hampshire. It is bordered on the east by the city of Portsmouth, on the north by the town of Newington, and on the southeast by the town of Greenland. The inactive base is located on the seacoast, approximately a 1-hour drive on Interstate 95 from Boston.

2.2 Site History

Pease AFB was operated as an airport by the Navy during World War II. In 1946, exclusive rights to the airfield were transferred from the Navy to the Air Force. In December 1988, Pease AFB was selected for closure and in March 1991, the base was closed as an active installation. The Air Force has transferred most of the former base to the Pease Development Authority (PDA) via a 55-year long-term lease in anticipation of eventual deeded transfer. The airfield is now a fully operational commercial airport. Other property is currently being used or developed for light commercial and industrial facilities (USEPA, 2002).

Pease AFB was listed on the National Priorities List on 21 February 1990 (55 Fed. Reg. 6154). As such, Pease AFB became a Superfund Site and subject to the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Reauthorization Act of 1986 (SARA), (collectively referred to as CERCLA or Superfund).

2.3 Site Descriptions

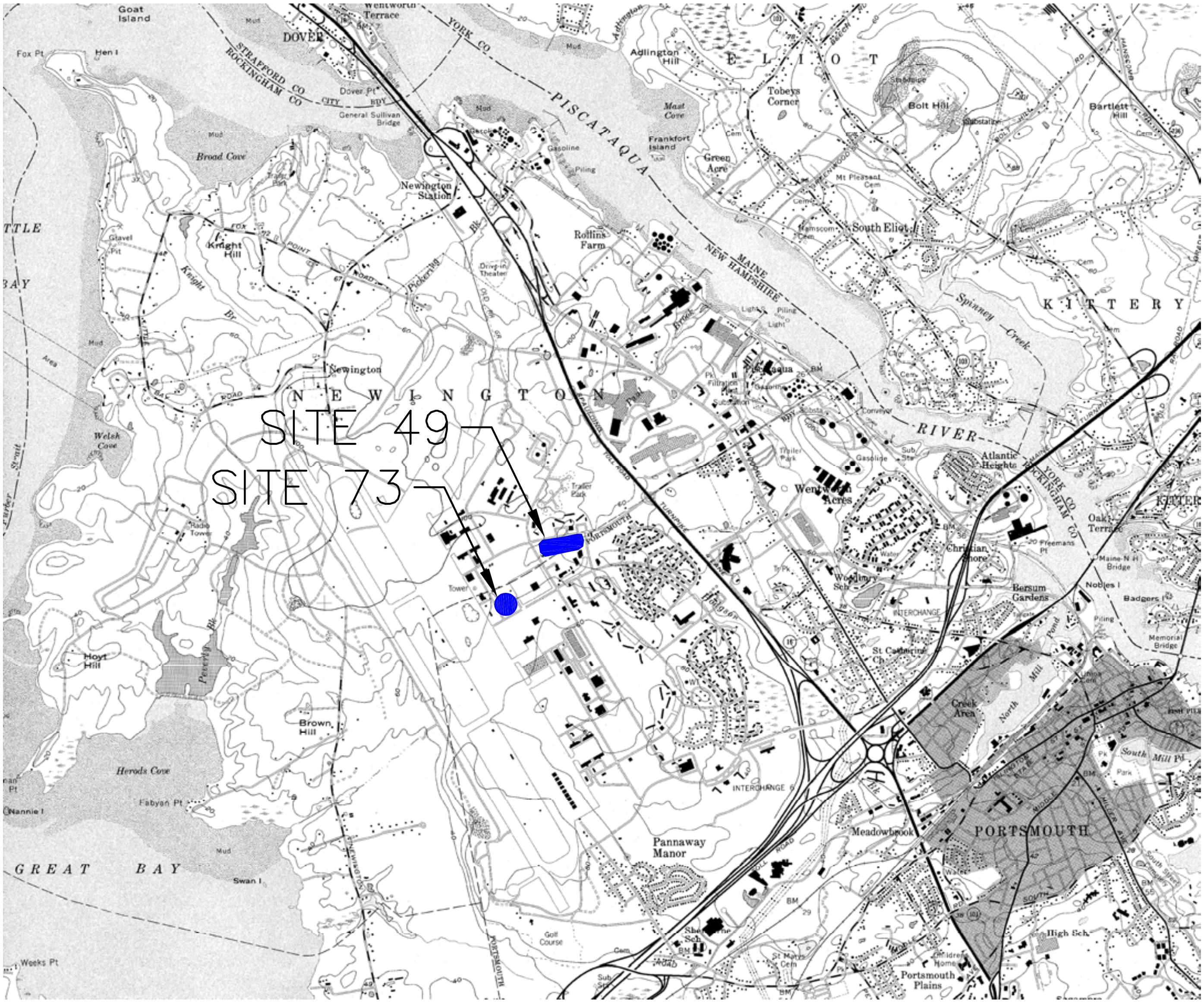
The PDBS demonstration at Pease AFB will take place at Sites 49 and 73 shown on Figure 2.1. At both sites, groundwater is primarily contaminated with tetrachloroethene (PCE), trichloroethene (TCE) and their daughter products. PCE and TCE were used at Sites 49 and 73 as solvents and degreasers until 1978. Contamination resulted from spills and/or on-site disposal of these compounds. At both sites, permeable reactive barriers (PRW) have been installed immediately downgradient of the source areas. Figures 2.2 and 2.3 show the site layouts for Sites 49 and 73, respectively.

2.4 Geology and Hydrogeology

The geology of Sites 49 and 73 can generally be described as three interconnected zones. Zone 1, occurring from ground surface to a depth of approximately 15 to 20 feet below ground surface (bgs), is the upper overburden, consisting mainly of fill material, silty sand, and glacial till comprised of a poorly sorted mixture of gravel, sand, and silt. At Site 49 Zone 1 is encountered from ground surface to a depth of approximately 15 to 20 feet below ground surface (bgs) (MWH, 2002b). At Site 73 Zone 1 extends from ground surface to a depth of approximately 24 to 36 feet bgs.

Zone 2 underlies the overburden and consists of the shallow bedrock that is highly fractured and weathered. At Site 49 Zone 2 is encountered at a depth of approximately 15 to 20 feet bgs and ranges in thickness from approximately 1 to 5 feet in the area of former Building 22 (Figure 2.2). At Site 73 Zone 2 ranges in thickness from 10 to 15 feet and is encountered at a depth of 24 to 36 feet bgs.

Zone 3 is the deep bedrock zone consisting of metamorphic phyllite and diabase intrusive rocks that becomes increasingly competent with depth (MWH, 2002b). At Site



Source:
7.5 minute U.S.G.S. quadrangle of Portsmouth, NH-ME;
dated 1956 and revised 1993.

MWH(2002a and 2002b)

0 2000 4000
SCALE: 1"=4000'

FIGURE 2.1

SITE LOCATION MAP

Passive Diffusion Bag Sampler Demonstration
Pease AFB, New Hampshire

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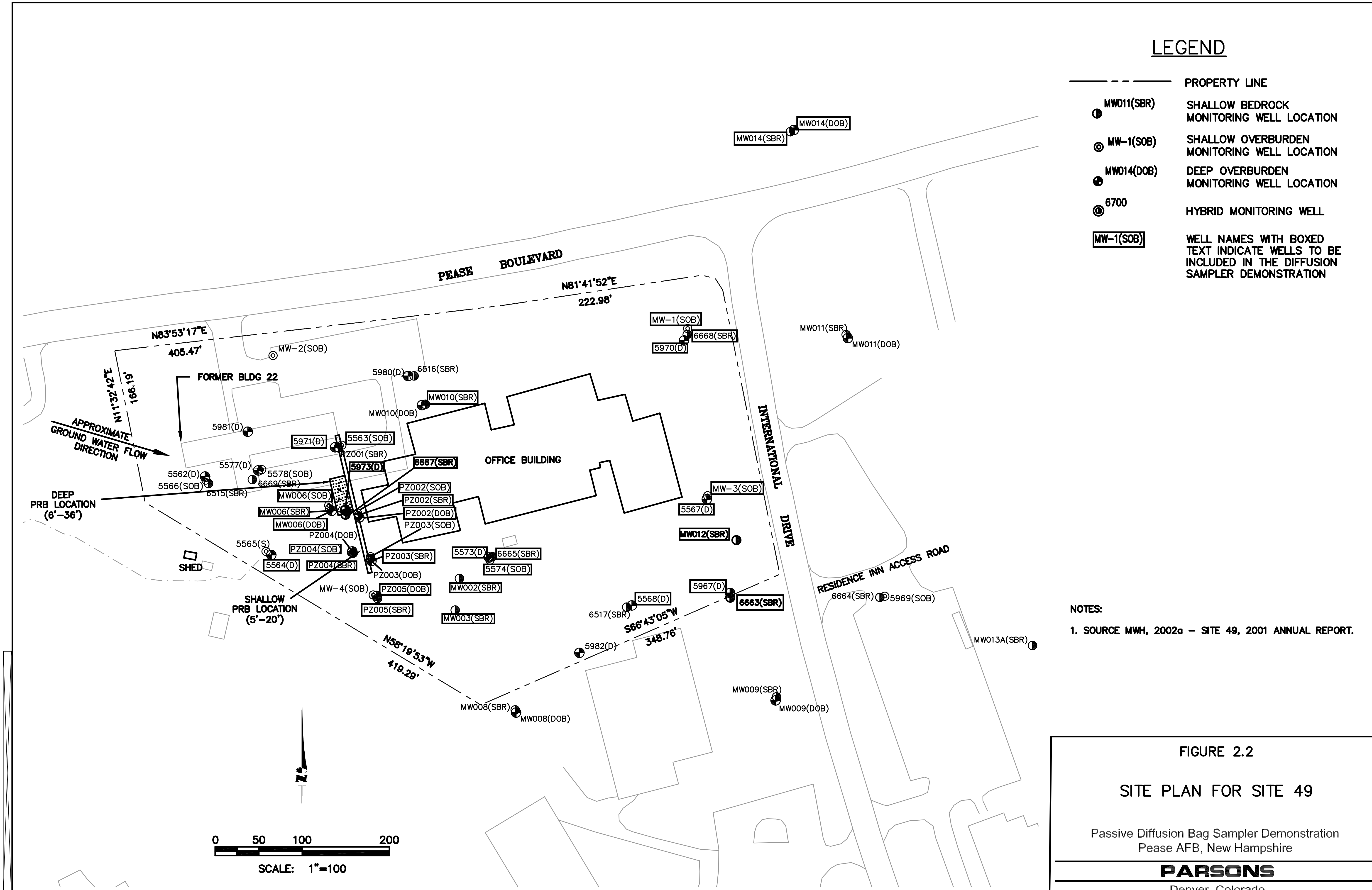

FIGURE 2.2

SITE PLAN FOR SITE 49

Passive Diffusion Bag Sampler Demonstration
Pease AFB, New Hampshire

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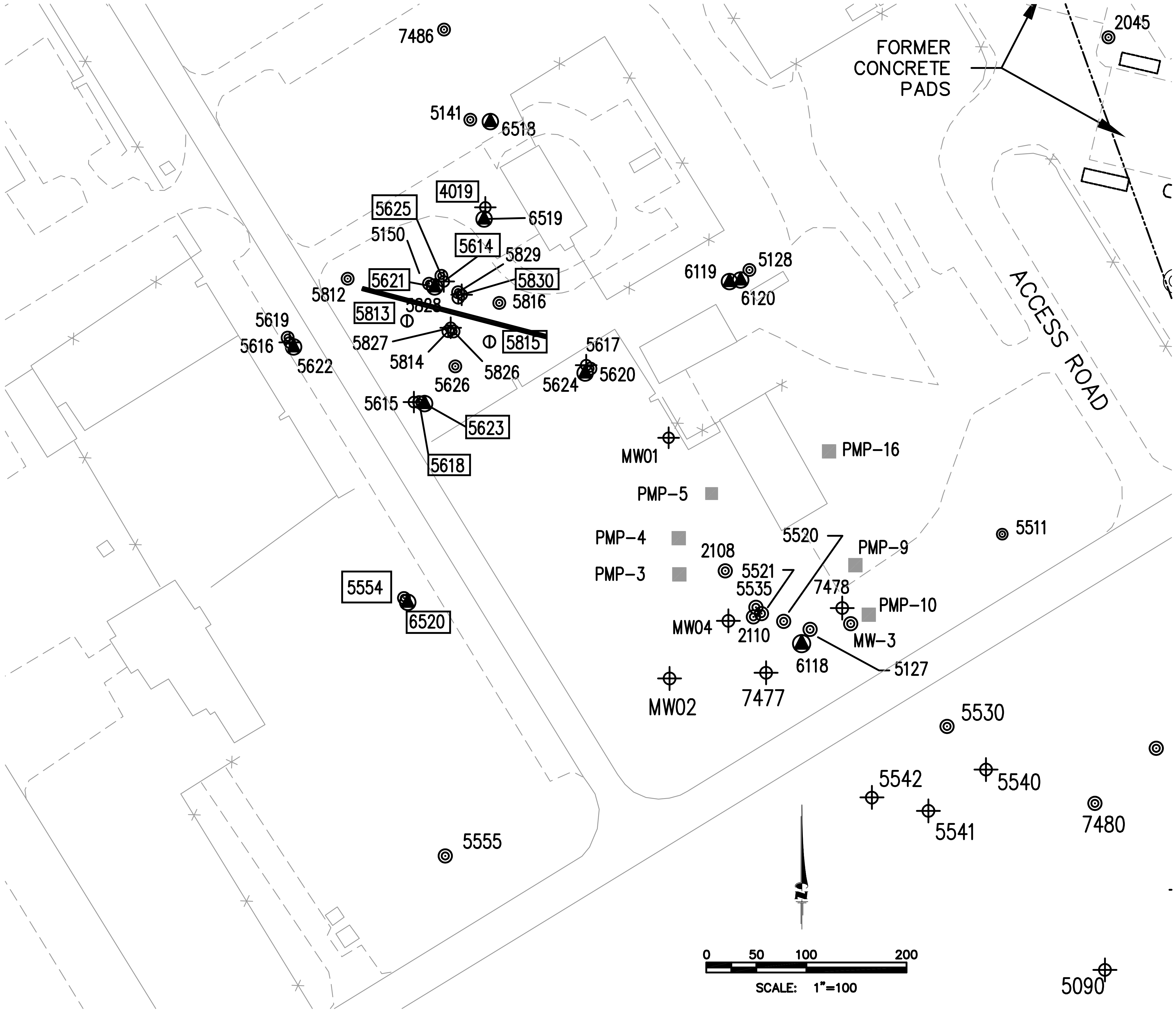

LEGEND

- PIEZOMETER
- DEEP OVERBURDEN MONITORING WELL (INCLUDING WELLS WITH LONG SCREENS)
- SHALLOW BEDROCK MONITORING WELL (FRACTURED)
- SHALLOW OVERBURDEN (WATER TABLE) MONITORING WELL
- HYBRID WELL
- AS-BUILT LAYOUT OF WALL
- 4019 WELL NAMES WITH BOXED TEXT INDICATE WELLS TO BE INCLUDED IN THE DIFFUSION SAMPLER DEMONSTRATION

NOTES:

SOURCE: MWH, 2002b – SITE 73, 2001 STATUS REPORT

FIGURE 2.3

SITE PLAN FOR SITE 73

Passive Diffusion Bag Sampler Demonstration
Pease AFB, New Hampshire

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Denver, Colorado

49 competent bedrock (Zone 3) has generally been encountered at depths ranging from 16 to 24 feet bgs in the area immediately downgradient of the former Building 22 (Figure 2.2) and depths ranging from 24 to 32 feet bgs in the downgradient plume. At Site 73 Zone 3 is located approximately 41 to 64 feet bgs.

Groundwater at Site 49 is generally located 4 to 8 feet bgs across the site and flows horizontally to the southeast. The horizontal hydraulic gradient of 0.027 foot per foot (ft/ft) has been calculated for both the overburden and the shallow bedrock. The vertical hydraulic gradient in the vicinity of the PRB is slightly downward to a depth of approximately 40 feet, where the gradient reverses to an upward direction. The horizontal groundwater seepage velocity for the overburden is calculated as ranging from 0.90 feet per day (ft/day) to 2.2×10^{-4} ft/day. Horizontal groundwater seepage velocity for the shallow bedrock ranges from 0.045 ft/day to 9.5×10^{-3} ft/day. These ranges of seepage velocity were calculated using the reported hydraulic conductivities, an average hydraulic gradient of 0.027 ft/ft and a porosity of 0.3 for overburden soils and 0.2 for shallow bedrock (MWH, 2002b).

Groundwater at Site 73 is approximately six feet bgs and flows to the south in the vicinity of the Site 73 source area, and then changes to a southeasterly and easterly direction in the downgradient portion of the plume. The reported groundwater seepage velocities for the site range from 0.12 to 0.96 ft/day for the overburden zone and 0.12 to 0.31 ft/day for the shallow bedrock zone (MWH, 2002a).

2.5 Nature and Extent of Contamination

Sites 49 and 73 are primarily contaminated with TCE, PCE and their associated degradation products. At Site 49 the maximum concentrations of PCE and TCE detected from the fall 2001 sampling event were 25 J (estimated) and 760 micrograms per liter (μg/L), respectively. At Site 73 the maximum concentrations of PCE and TCE detected in the fall 2001 sampling event were 5.7 and 832 μg/L, respectively.

3.0 SCOPE OF PDBS DEMONSTRATION

A maximum of 92 samples will be collected from 44 monitoring wells located at Sites 49 and 73 at Pease AFB as part of this project. The 44 monitoring wells have been chosen because they 1) will be sampled for VOCs by MWH as part of the long-term monitoring for the sites, 2) previously had VOCs detected in analytical samples, and 3) do not contain any dedicated equipment (e.g., pressure transducers). The monitoring wells that will be sampled during this PDBS demonstration are summarized in Table 3.1, and their locations are shown on Figures 2.2 and 2.3

3.1 Field Activities

Monitoring wells selected for VOC sampling using the PDBS technique (Table 3.1) were chosen from the list of monitoring wells targeted for sampling by MWH scheduled to begin 23 September 2002. An estimated 92 PDBS in 44 wells will be analyzed as part of this project at Pease AFB.

PDBSs deployed during this demonstration will be installed and retrieved in general accordance with the diffusion sampler installation and recovery standard operating procedures presented in Appendix B of the AFBCA PDBS Project Work Plan (Parsons, 2002). PDBSs will be installed throughout the screened interval of each well at a frequency of 1 PDBS per 3 feet of saturated screen (rounded to the nearest whole number) to obtain a vertical profile of contaminant concentrations. The PDBSs will be retrieved from the wells immediately prior to the September/October 2002 conventional sampling event to be completed by MWH.

Sample aliquots from PDBSs installed in the 44 wells targeted for sampling will analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method 8260B. The PDBS samples will be analyzed by the same laboratory and analytical method as the samples collected by MWH for their conventional sampling of the same wells. It is anticipated that samples collected from Site 49 will be shipped to Columbia Analytical Services (CAS) in Redding, California, and the samples from Site 73 will be shipped to Mitkem Corporation in Warwick, Rhode Island. The analyses will

TABLE 3.1
SAMPLING LOCATION SUMMARY
PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION
PEASE AFB, NEW HAMPSHIRE

Well Name	Site	Well Type[a/]	Screen Interval (ft bgs)[b/]	Total Depth (ft bgs)	Screen Length (feet)	Estimated No. of Samplers	Reference Elevation (ft amsl)[c/]	Northing (feet)	Easting (feet)	Ground Surface Elevation (ft amsl)	Fall 2001 Groundwater Elevation (ft amsl)	Groundwater Depth (ft btoc)[d/]	October 2001 Analytical Results for Selected Compounds (micrograms per liter)
4019	73	Shallow Overburden	9.2 -- 23.2	24.0	14	5	78.32	213,848	1,211,382	78.7	70.33	7.99	TCE[e/] = 230, cis-1,2-DCE[f/] =890
5554	73	Deep Overburden	40.5 -- 45.5	46.5	5	2	77.06	213,536	1,211,317	77.4	69.04	8.02	TCE = 23, cis-1,2-DCE =37
5614	73	Water Table	10.0 -- 15.0	15.0	5	2	77.60	213,787	1,211,347	78.0	70.20	7.40	TCE = 27, cis-1,2-DCE = 250, PCE[g/] = 5.7
5618	73	Deep Overburden	36.6 -- 41.6	41.6	5	2	73.72	213,691	1,211,327	74.3	69.71	4.01	TCE = 59, cis-1,2-DCE = 96
5621	73	Shallow Bedrock	51.7 -- 56.7	56.5	5	2	77.37	213,783	1,211,340	77.9	70.00	7.37	TCE = 1.2, cis-1,2-DCE = 2
5623	73	Shallow Bedrock	52.4 -- 57.4	58.0	5	2	73.96	213,690	1,211,332	74.3	69.74	4.22	TCE = 1, cis-1,2-DCE = 7.4
5625	73	Deep Overburden	29.2 -- 34.2	34.2	5	2	77.69	213,791	1,211,345	78.1	70.38	7.31	TCE = 69, cis-1,2-DCE = 84
5813	73	Hybrid	41.5 -- 46.4	47.2	5	2	76.92	213,759	1,211,311	77.6	70.03	6.89	TCE = 85, cis-1,2-DCE = 130, VC[h/] = 5.3
5815	73	Hybrid	38.0 -- 42.9	43.0	5	2	76.73	213,736	1,211,394	77.5	69.83	6.90	TCE = 28, cis-1,2-DCE = 48
5830	73	Shallow Bedrock	45.6 -- 50.6	51.0	5	2	63.95*	213,048	1,212,341	77.9	70.12	N/A[i/]	TCE = 1.7, cis-1,2-DCE = 63
6520	73	Shallow Bedrock	50.7 -- 60.7	61.0	10	3	77.09	213,533	1,211,320	77.3	69.01	8.08	TCE = 26, cis-1,2-DCE = 77
5563(SOB)	49	Shallow Overburden	5.0 -- 14.0	14.0	9	2	72.91	215,306	1,213,011	75.3	66.18	6.73	TCE = 6
5564(D)	49	Deep Overburden	16.0 -- 20.5	20.5	5	2	73.21	215,180	1,212,930	74.0	67.12	6.09	TCE = 11
5567(D)	49	Deep Overburden	17.0 -- 21.0	21.0	4	1	68.42	215,244	1,213,430	68.8	61.76	6.66	TCE = 37
5568(D)	49	Deep Overburden	10.5 -- 15.5	15.5	5	2	68.70	215,122	1,213,344	68.2	61.98	6.72	TCE = 6.8
5573(D)	49	Deep Overburden	13.5 -- 17.5	17.5	4	1	69.30	215,177	1,213,180	69.5	62.83	6.47	TCE = 80, cis-1,2-DCE = 45
5574(SOB)	49	Shallow Overburden	6.0 -- 11.0	11.0	5	1	69.23	215,174	1,213,181	69.1	62.54	6.69	TCE = 6.3
5967(D)	49	Deep Overburden	23.0 -- 28.0	28.0	5	2	69.84	215,136	1,213,457	70.3	61.46	8.38	TCE = 76
5970(D)	49	Deep Overburden	27.0 -- 32.0	32.0	5	2	68.83	215,426	1,213,404	69.2	60.56	8.27	TCE = 18, cis-1,2-DCE = 23
5971(D)	49	Deep Overburden	7.2 -- 12.2	12.2	5	2	73.05	215,304	1,213,003	73.4	66.45	6.60	TCE = 11
5973(D)	49	Deep Overburden	10.3 -- 15.3	15.3	5	2	71.79	215,231	1,213,015	72.0	66.74	5.05	TCE = 92
6663(SBR)	49	Shallow Bedrock	29.0 -- 34.0	34.0	5	2	69.91	215,131	1,213,457	70.2	61.41	8.50	TCE = 5.6
6665(SBR)	49	Shallow Bedrock	15.8 -- 20.8	20.8	5	2	71.80	215,178	1,213,184	69.7	N/A	N/A	TCE = 100, cis-1,2-DCE = 83, VC = 26
6667(SBR)	49	Shallow Bedrock	15.5 -- 20.5	20.5	5	2	71.87	215,226	1,213,015	71.9	66.56	5.31	TCE = 76
6668(SBR)	49	Shallow Bedrock	33.3 -- 38.3	38.3	5	2	68.29	215,433	1,213,408	68.7	60.23	8.06	TCE = 16, cis-1,2-DCE = 25
MW002(SBR)	49	Shallow Bedrock	29.5 -- 39.5	39.5	10	3	69.44	215,153	1,213,146	69.4	62.99	6.45	TCE = 82, 1,1-DCE = 7.2, VC = 6.3
MW003(SBR)	49	Shallow Bedrock	24.5 -- 34.5	34.5	10	3	70.08	215,117	1,213,141	70.1	63.27	6.81	TCE = 120, 1,1-DCE = 12, VC = 2.4 J[j/]
MW006(DOB)	49	Deep Overburden	14.5 -- 19.5	19.5	5	2	71.36	215,233	1,212,997	71.9	66.90	4.46	TCE = 17 J
MW006(SBR)	49	Shallow Bedrock	24.5 -- 34.5	34.5	10	3	71.63	215,231	1,212,999	72.0	66.23	5.40	TCE = 10, PCE = 25 J, VC = 7.4
MW006(SOB)	49	Shallow Overburden	4.0 -- 9.0	9.0	5	2	71.90	215,237	1,212,996	71.9	70.11	1.79	TCE = 760, PCE = 8.2 J, VC = 7.4
MW010(SBR)	49	Shallow Bedrock	13.0 -- 18.0	18.0	5	2	70.59	215,353	1,213,107	70.8	64.67	5.92	TCE = 0.9 J, cis-1,2-DCE = 1.9
MW012(SBR)	49	Shallow Bedrock	25.5 -- 30.5	30.5	5	2	69.05	215,197	1,213,464	69.4	62.00	7.05	TCE = 4.5, cis-1.2-DCE = 46, VC = 7.1
MW014(DOB)	49	Deep Overburden	20.0 -- 25.0	25.0	5	2	66.23	215,668	1,213,530	64.4	N/A	N/A	TCE = 9.5, cis-1,2-DCE = 9.3
MW014(SBR)	49	Shallow Bedrock	29.5 -- 34.5	34.5	5	2	66.37	215,666	1,213,526	64.4	56.49	9.88	TCE = 7, cis-1,2-DCE = 15
MW-1(SOB)	49	Shallow Overburden	7.0 -- 17.0	17.0	10	3	68.49	215,440	1,213,408	68.8	60.35	8.14	TCE = 2.1
MW-3(SOB)	49	Shallow Overburden	7.0 -- 17.0	17.0	10	3	69.46	215,248	1,213,431	68.7	61.45	8.01	TCE = 0.98 J
PZ002(DOB)	49	Deep Overburden	9.5 -- 14.5	14.5	5	2	72.20	215,223	1,213,031	72.1	65.51	6.69	TCE = 68
PZ002(SBR)	49	Shallow Bedrock	16.5 -- 21.5	21.5	5	2	72.21	215,225	1,213,030	72.2	65.51	6.70	TCE = 27 J
PZ002(SOB)	49	Shallow Overburden	4.0 -- 9.0	9.0	5	1	71.97	215,228	1,213,029	72.2	65.32	6.65	TCE = 0.95 J, cis-1,2-DCE = 4.3, VC = 1.2
PZ003(SBR)	49	Shallow Bedrock	19.0 -- 24.0	24.0	5	2	72.37	215,176	1,213,044	72.5	64.95	7.42	TCE = 220, cis-1,2-DCE = 50, 1,1-DCA = 60
PZ004(SBR)	49	Shallow Bedrock	19.5 -- 24.5	24.5	5	2	71.77	215,182	1,213,024	71.9	65.29	6.48	TCE = 120, cis-1,2-DCE = 11
PZ004(SOB)	49	Shallow Overburden	5.0 -- 10.0	10.0	5	1	71.55	215,183	1,213,022	72.0	65.53	6.02	TCE = 12
PZ005(DOB)	49	Deep Overburden	11.5 -- 16.5	16.5	5	2	71.05	215,133	1,213,051	71.3	64.00	7.05	TCE = 0.96 J, cis-1,2-DCE = 14, VC = 8.7
PZ005(SBR)	49	Shallow Bedrock	19.2 -- 24.2	24.2	5	2	71.07	215,130	1,213,052	71.3	64.05	7.02	TCE = 2.3, cis-1,2-DCE = 33, VC = 2.7

[a/] Well Type = Screened interval for the well. Hybrid wells are screened across the deep overburden and shallow bedrock interface, which is the principal flow path for contaminated groundwater.
[b/] ft bgs = feet below ground surface.
[c/] ft amsl = feet above mean sea level.
[d/] ft btoc = feet below top of casing (reference elevation).

[e/] TCE = trichloroethene.
[f/] DCE = dichloroethene.
[g/] PCE = tetrachloroethene.
[h/] VC = vinyl chloride.
[i/] N/A = not available.

[j/] J = estimated.
* = error in datum suspected.

be performed in accordance with the *Final Installation-Wide Qualiy Program Plan* (MWH, 2001) Field quality control samples will be collected at the following frequencies:

- 10 percent field duplicates,
- 5 percent matrix spikes and matrix spike duplicates,
- 1 pre-installation equipment rinseate,
- 1 pre-installation source water blank, and
- Approximately 4 trip blanks (1 per cooler of samples).

The *Final Installation-Wide Qualiy Program Plan* (MWH, 2001) will be adopted as the site-specific Sampling and Analysis Plan (SAP) for the PDBS demonstration where appropriate. Appendix C presents pertinent information from the *Final Installation-Wide Qualiy Program Plan* (MWH, 2001) regarding groundwater sampling proceedures, well inspection, and decontamination of equipment. The PDBS-specific methods and procedures outlined in the AFBCA Program SAP (Parsons, 2002) will be adhered to during all PDBS-related activities at Pease AFB.

Investigation derived waste water generated during the deployment (i.e., decontamination water) and retrieval of the PDBS (i.e., unused water from the samplers and equipment decontamination water) will be disposed of in the on-site water treatment plant located adjacent to the MWH field office on Short Street. Other trash such as the used PDBS, rope, paper towels, nitrile gloves will be properly collected for disposal as municipal solid waste and disposed of in trash recepticals located adjacent to the MWH field office.

3.2 Analytical Results Comparison/Evaluation

Analytical results for groundwater samples collected using the PDB and conventional sampling techniques will be compared, and the results will be evaluated. Typically, if maximum concentrations from the PDBSs are higher than concentrations in samples collected using the conventional method, it is probable that the PDBS concentrations are more representative of ambient groundwater chemistry conditions than are the conventional-sampling data (Vroblesky, 2001). Considering this guidance, if the maximum analytical result obtained using PDB sampling is greater than or equal to the conventional sampling result, it will indicate that the PDBS method is appropriate for use in that particular well. If, however, the conventional method produces VOC results that are higher by a predetermined amount than the concentrations reported for the PDBSs, then the PDBS method may not adequately represent local ambient groundwater conditions. In this case, the difference may be due to a variety of factors, including hydraulic and chemical heterogeneity within the saturated screened interval of the well, vertical flow of groundwater within the well, and/or the relative permeability of the well screen with respect to the surrounding aquifer matrix (Vroblesky, 2001).

Analytical results for all samples collected using the diffusion samplers will be compared to results from the conventional sampling using relative-percent-difference (RPD), as defined by the following equation:

$$RPD = 100[abs(D-C)]/[(D+C)/2]$$

Where:

abs = absolute value

D = diffusion sampler result

C = conventional sample result.

Therefore, multiple RPD values will be computed for each well, despite the fact that there is only one conventional sampling result. Each RPD value will be compared to predefined acceptance criteria to determine whether it is within the acceptable range.

For this investigation, an RPD of less than 30 will be considered to demonstrate good correlation between sample results. In summary, the acceptance criteria that will be used are:

- If at least one PDBS result for a given well is equal to or greater than the conventional sampling result, PDBS will be deemed appropriate for use in that well.

- If either the PDBS or the conventional sample result is greater than three times the laboratory reporting limit (RL), and the PDBS result is less than the conventional result, an RPD of 30 will be used as the acceptance criterion.

- If both the PDBS and conventional sample results are less than three times the laboratory RL, a value of ± the lowest RL will be used as the range of acceptance between the two values.

4.0 PROJECT ORGANIZATION

Addresses and telephone numbers of the Pease PDBS project team are as follows:

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5.0 SCHEDULE

Work performed, as part of this demonstration at Pease AFB will be completed according to the schedule summarized below.

- Submittal of the Draft Site-Specific PDBS Work Plan: 16 August 2002.
- Receipt of Draft Site-Specific PDBS Work Plan Comments: 30 August 2002.
- Submittal of the Final Site-Specific PDBS Work Plan: 6 September 2002.
- Installation of the PDB samplers at Pease AFB: 10 and 11 September 2002.

- Retrieval of the PDB samplers at Pease AFB: 26 and 27 September 2002.
- Submittal of the Preliminary Internal Draft Site-Specific PDBS Report: February 2002.

6.0 REPORTING

The site-specific results report will provide a table identifying the location and depth for each PDBS collected. The analytical results collected by Parsons as part of this study will be compared to conventional-sampling analytical results collected by MWH using the procedures described in Section 3.2. The results of the statistical comparisons will be clearly and logically presented in the site-specific results report. Comparison methods will include calculation of RPDs between PDBS and conventional sampling results. In addition, the relative costs of PDB and conventional groundwater sampling will be compared.

The report will include a qualitative review of data sets when the correlation criteria for a well or compound are met in less than 70 percent of the comparisons. The purpose of this review will be to attempt to determine the most likely reason(s) why correlation criteria were not met. The arbitrary threshold value of 70 percent is not intended to indicate success or failure of PDBS, but rather to focus further review on those wells or analytes where a lower correlation was observed. If there are wells or compounds for which the correlation criteria were not as consistently met, and it is not clear that the lack of correlation was due to a one-time, explainable occurrence (e.g., air bubbles in the sample vials for a particular sample), then the report will likely state that further evaluation of those wells/compounds should be performed before the PDBS method is implemented full scale to monitor those wells/compounds. The draft version of this report will be distributed according to the schedule shown in Section 5.0.

7.0 REFERENCES

MWH. 2001. Final Installation-Wide Quality Program Plan. Pease Air Force Base, Portsmouth, New Hampshire. July.

MWH 2002a. *Site 73, 2001 Status Report*. Pease Air Force Base, Portsmouth, New Hampshire. February.

MWH. 2002b. *Site 49, 2001 Status Report*. Pease Air Force Base, Portsmouth, New Hampshire. May.

Parsons, 2002. *Draft Work Plan for the Air Force Base Conversion Agency Passive Diffusion Sampler Demonstration*. February.

US Environmental Protection Agency (USEPA), 2002. *EPA New England Fact Sheet – Pease Air Force Base.* USEPA Region 1 website. http://yosemite.epa.gov/r1/npl_pad.nsf/f52fa5c31fa8f5c885256adc0050b631/9E95FBAD0CEC73E0852568FF005ADB09?OpenDocument

Vroblesky, D.A., 2001. *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells*. US Geological Survey Water-Resources Investigations Report 01-4060. Columbia, South Carolina.

APPENDIX A

HEALTH AND SAFETY PLAN ADDENDUM

(Posted separately to the website)

APPENDIX B

HISTORIC SITE DATA

(Posted separately to the website)

APPENDIX C

APPLICABLE STANDARD OPERATING PROCEDURES

APPENDIX C

APPLICABLE STANDARD OPERATING PROCEDURES

This Appendix contains applicable pages from Appendix A of the *Final Installation-Wide Qualiy Program Plan* (MWH, 2001). The pages included are:

- Standard Operating Procedure, Groundwater Sampling. Procedure Number 9001. Pages 7 of 19, 8 of 19, 9 of 19, 11 of 19, 12 of 19, 13 of 19, and 14 of 19.

- Decontamination of Field Sampling Equipment. Procedure Number 9005. Pages 6 of 7 and 7 of 7.